

Jeffrey D. Erickson, MSc, PhD

Associate Professor of Pharmacology and Neuroscience

Education

1987-1992 PhD, George Washington University, Washington, DC
1982-1984 MSc, University of Colorado, Boulder, CO
1975-1981 BA, University of Colorado, Boulder, CO

Positions

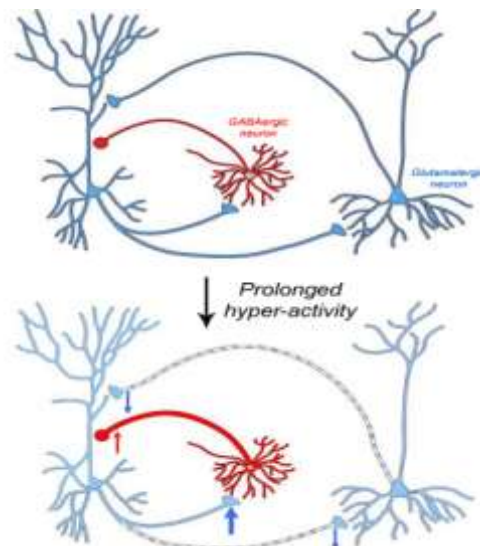
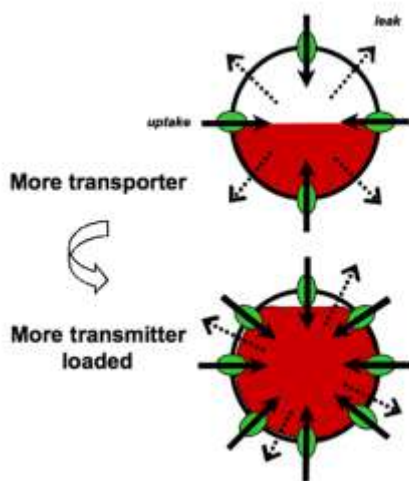
2002-present Associate Professor of Pharmacology and Neuroscience,
Neuroscience Center of Excellence
LSU Health Sciences Center, New Orleans, LA
1997-2002 Assistant Professor of Pharmacology and Neuroscience,
Neuroscience Center of Excellence
LSU Health Sciences Center, New Orleans, LA
1993-1997 Postdoc, Laboratory of Cell Biology, NIMH, Bethesda, MD
1984-1987 Guest Researcher, Department of Pharmacology,
University of Colorado, Denver, CO



Current Research

Vesicular glutamate transporters in regulation of quantal size and release probability

Presynaptic mechanisms that contribute to quantal variance and synaptic plasticity are poorly understood. Our work has established that, for mammalian cortical glutamatergic synaptic vesicles that express VGLUT1, quantal size is determined by the number of transporters *per* vesicle, and that this density is endogenously regulated both across development and by prolonged changes in activity of mature neural networks. In addition, we have shown that VGLUT1 plays an unanticipated role in synapses; it interacts with adaptor proteins within axonal boutons that likely decrease the availability of these vesicles for synaptic release, compared to VGLUT2. We use primary cortical cultures, organotypic hippocampal slice cultures, *in vivo* knockout animals, yeast two-hybrid analyses, and biochemical procedures to address these issues. Our research contributes understanding to the differential role for VGLUT1 and VGLUT2 isoforms in mechanisms of presynaptic plasticity in developing and adult cortical neuronal circuits *in vitro* and *in vivo*. The results from our studies also provide insights into the adaptive mechanism of glutamatergic hyperactivity relevant to epilepsy and neurodegeneration, and in psychiatric disorders such as anxiety, depression and addiction.



Left, The 'leaky bathtub' model of filling mammalian CNS synaptic vesicles is dependent upon transporter number and the cytoplasmic transmitter concentration. Right, Homeostatic regulation of the excitation-inhibition (E/I) balance in cortical networks, according to Turrigiano and Nelson (2004). Prolonged hyperactivity induces increases in excitatory synaptic strength onto GABAergic neurons (Red, via recurrent feed-back inhibition) and decreases in strength onto pyramidal neuronal dendrites (Blue, via feed-forward excitation). Our working model

is that vesicular transporter isoforms for glutamate control quantal size and quantal content at discrete synapses to determine presynaptic strength and restore E/I balance.

Awards/Honorary Lectures

- 2006-2009 NARSAD Independent Investigator Award
2004 Minisymposium in tribute to Frode Fonnum: *From Neuroanatomy to Neurochemistry*. University of Oslo, Oslo, Norway, November 5, 2004 (Keynote speaker)
2000 Gordon Research Conference at Connecticut College, (Session Chair, present Introduction and Lecture) New London, CT, 22-27 July, 2000.
1998 LSUMC Neuroscience Center Excellence Award
1995 NIH Fellows Award for Research Excellence

Key Recent Papers

1. Mackenzie, B., Illing, A.C., Morris, M.E.K., Varoqui, H., and **Erickson, J.D.** (2008) *Analysis of a vesicular glutamate transporter (VGLUT2) supports a cell leakage mode in addition to vesicular packaging.* Neurochem. Res. 33, 238-247.
2. De Gois, S., Jeanclos, E., Morris, M., Grewal, S., Varoqui, H., and **Erickson, J.D.** (2006) *Identification of endophilins 1 and 3 as selective binding partners for VGLUT1 and their co-localization in neocortical glutamatergic synapses: implication for vesicular glutamate transporter trafficking and excitatory vesicle formation.* Cell. Mol. Neurobiol. 26, 677-691.
3. **Erickson, J.D.**, De Gois, S., Varoqui, H., Schafer, M.K., and Weihe, E. (2006) *Activity-dependent regulation of vesicular glutamate and GABA transporters: a means to scale quantal size.* Neurochem. Int. 48, 643-649.
4. De Gois, S., Schafer, M.K., Defamie, N., Chen, C., Ricci, A., Weihe, E., Varoqui, H., and **Erickson, J.D.** (2005) *Homeostatic scaling of vesicular glutamate and GABA transporter expression in rat neocortical circuits.* J. Neurosci. 25, 7121-7133.
5. Wilson, N.R., Kang, J., Hueske, E.V., Leung, T., Varoqui, H., Murnick, J.G., **Erickson, J.D.**, and Liu, G. (2005) *Presynaptic regulation of quantal size by VGLUT1.* J. Neurosci. 25, 6221-6234.
6. Mackenzie, B., and **Erickson, J.D.** (2004) *Sodium-coupled neutral amino acid (System N/A) transporters of the SLC38 gene family.* Pflugers Arch. 447, 784-795.
7. Schäfer, M.K.-H., Varoqui, H., Defamie, N., Weihe, E., and **Erickson, J.D.** (2002) *Molecular cloning and functional identification of mouse vesicular glutamate transporter 3 and its expression in subsets of novel excitatory neurons.* J. Biol. Chem. 277, 50734-50748.
8. Varoqui, H., Schäfer, M.K.-H., Zhu, H., Weihe, E., and **Erickson, J.D.** (2002) *Identification of the differentiation-associated Na^+/P_i transporter as a novel vesicular glutamate transporter expressed in a distinct set of glutamatergic synapses.* J. Neurosci. 22, 142-155.
9. Zhu, H., Varoqui, H., Duerr, J., McManus, J.R., Rand, J., and **Erickson, J.D.** (2001) *Analysis of unc-17 point mutants in *Caenorhabditis elegans* reveals domains of the vesicular acetylcholine transporter involved in substrate translocation.* J. Biol. Chem. 276, 41580-41587.
10. **Erickson, J.D.** and Varoqui, H. (2000) *Molecular analysis of vesicular amine transporter function and targeting to secretory organelles.* FASEB J. 14, 2450-2458.

Funding

“Vesicular Transporter Specificity”

Principle Investigator: Jeffrey D. Erickson, PhD

Agency: NINDS/NIH (2RO1NS36936-10). Period: 04/01/04 – 03/31/09

“Scaling of Vesicular Glutamate and GABA Storage in Neocortical Synapses”

Principle Investigator: Jeffrey D. Erickson, PhD

Agency: NARSAD (NARSAD Southwest Florida Investigator) Period: 09/15/06 – 09/14/09